AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions, and listings, of claims in the application.

Listing of Claims

1. (currently amended) A process for producing a purified aqueous hydrogen peroxide solution comprising contacting an aqueous hydrogen peroxide solution containing metal ion impurities in a three-step ion exchange resin consisting of

firstly with a H^+ ~~type~~ cation exchange resin,

secondly with a carbonate ion (CO_3^{2-}) ~~type~~ or bicarbonate ion (HCO_3^-) ~~type~~ anion exchange resin, and

thirdly with a H^+ ~~type~~ cation exchange resin.

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2. (currently amended) A process for producing a purified aqueous hydrogen peroxide solution comprising contacting an aqueous hydrogen peroxide solution containing metal ion impurities in a four-step ion exchange resin consisting of

firstly with a H^+ ~~type~~ cation exchange resin,

secondly with a fluoride ion (F^-) ~~type~~ anion exchange resin,

thirdly with a carbonate ion (CO_3^{2-}) ~~type~~ or bicarbonate ion (HCO_3^-) ~~type~~ anion exchange resin, and

fourthly with a H^+ ~~type~~ cation exchange resin.

3. (currently amended) The process for producing a purified aqueous hydrogen peroxide solution as claimed in claim 1, wherein the aqueous hydrogen peroxide solution is contacted with an adsorption resin before ~~contacted with~~ contacting the H^+ ~~type~~ cation exchange resin.

4. (currently amended) The process for producing a purified aqueous hydrogen peroxide solution as claimed in claim 1, wherein said H^+ ~~type~~ cation exchange resin is regenerated by repeating a process, two or more times, in which the cation exchange resin is treated with a downward flowing inorganic acid aqueous solution and then washed with ultra-pure water.

5. (currently amended) The process for producing a purified aqueous hydrogen peroxide solution as claimed in claim 1, wherein the carbonate ion (CO_3^{2-}) ~~type~~ or bicarbonate ion (HCO_3^-) ~~type~~ anion exchange resin is regenerated by repeating a process, two or more times, in which the anion exchange resin is treated with a sodium carbonate or sodium bicarbonate aqueous solution and then washed with ultra-pure water.

6. (currently amended) The process for producing a purified aqueous hydrogen peroxide solution as claimed in claim 2, wherein the fluoride ion (F^-) ~~type~~ anion exchange resin is regenerated by repeating a process, two or more times, in which the anion exchange resin is treated with at least one fluorine compound aqueous solution selected from the group consisting of sodium fluoride, potassium fluoride and ammonium fluoride and then washed with ultra-pure water.

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7. (previously presented) The process for producing a purified aqueous hydrogen peroxide solution as claimed in claim 3, wherein the adsorption resin is regenerated by treating with an alcohol aqueous solution as a regenerant and then washing with ultra-pure water.

8. (previously presented) The process for producing a purified aqueous hydrogen peroxide solution as claimed in claim 1, wherein the hydrogen peroxide concentration in the aqueous hydrogen peroxide solution is 40 to 70 % by weight.

9. (currently amended) The process for producing a purified aqueous hydrogen peroxide solution as claimed in claim 1, wherein said purified aqueous hydrogen peroxide solution is obtained by filtrating ~~a~~ solid impurities contained in the aqueous hydrogen peroxide solution to which a flocculating agent has been preliminarily added, by a ~~fine~~ filter having an average pore size of 0.2 μm or less.

10. (original) The process for producing a purified aqueous hydrogen peroxide solution as claimed in claim 9, wherein said flocculating agent is at least one

phosphorus based compound selected from the group consisting of phosphoric acid, polyphosphoric acid, acidic sodium pyrophosphate, aminotri(methylenephosphoric acid) and salt thereof, and ethelenediaminetetra(methylenephosphoric acid) and salt thereof.

11. (original) The process for producing a purified aqueous hydrogen peroxide solution as claimed in claim 10, wherein said phosphorus based compound is added in an amount that the atomic ratio (Al/P) of the Al ion impurity contained in the aqueous hydrogen peroxide solution in terms of a metal atom Al to the phosphorus based compound in terms of a phosphorus atom is 0.045 or less.

12. (currently amended) The process for producing a purified aqueous hydrogen peroxide solution as claimed in claim 9, wherein the fine filter has an average pore size of ~~0.2~~ 0.1 μm or less.

13. (currently amended) The process for producing a purified aqueous hydrogen peroxide solution as claimed in claim 2, wherein the aqueous hydrogen peroxide solution is contacted with an adsorption resin before ~~contacted with~~ contacting the H^+ ~~type~~ cation exchange resin.

14. (currently amended) The process for producing a purified aqueous hydrogen peroxide solution as claimed in claim 2, wherein said H^+ ~~type~~ cation exchange resin is regenerated by repeating a process, two or more times, in which the cation exchange resin is treated with a downward flowing inorganic acid aqueous solution and then washed with ultra-pure water.

15. (currently amended) The process for producing a purified aqueous hydrogen peroxide solution as claimed in claim 3, wherein said H^+ ~~type~~ cation exchange resin is regenerated by repeating a process, two or more times, in which the cation exchange resin is treated with a downward flowing inorganic acid aqueous solution and then washed with ultra-pure water.

16. (currently amended) The process for producing a purified aqueous hydrogen peroxide solution as claimed in claim 2, wherein the carbonate ion (CO_3^{2-}) ~~type~~ or bicarbonate ion (HCO_3^-) ~~type~~ anion exchange resin is regenerated by repeating a process, two or more times, in which the anion exchange resin is treated with a sodium carbonate or sodium bicarbonate aqueous solution and then washed with ultra-pure water.

17. (currently amended) The process for producing a purified aqueous hydrogen peroxide solution as claimed in claim 3, wherein the carbonate ion (CO_3^{2-}) ~~type~~ or bicarbonate ion (HCO_3^-) ~~type~~ anion exchange resin is regenerated by repeating a process, two or more times, in which the anion exchange resin is treated with a sodium carbonate or sodium bicarbonate aqueous solution and then washed with ultra-pure water.

18. (currently amended) The process for producing a purified aqueous hydrogen peroxide solution as claimed in claim 4, wherein the carbonate ion (CO_3^{2-}) ~~type~~ or bicarbonate ion (HCO_3^-) ~~type~~ anion exchange resin is regenerated by repeating a process, two or more times, in which the anion exchange resin is treated with a sodium carbonate or sodium bicarbonate aqueous solution and then washed with ultra-pure water.

19. (currently amended) The process for producing a purified aqueous hydrogen peroxide solution as claimed in claim 3, wherein the fluoride ion (F^-) ~~type~~ anion exchange resin is regenerated by repeating a process, two or more times, in which the anion exchange resin is treated with at least one fluorine compound aqueous solution selected from the group consisting of sodium fluoride, potassium fluoride and ammonium fluoride and then washed with ultra-pure water.

20. (currently amended) The process for producing a purified aqueous hydrogen peroxide solution as claimed in claim 4, wherein the fluoride ion (F^-) ~~type~~ anion exchange resin is regenerated by repeating a process, two or more times, in which the anion exchange resin is treated with at least one fluorine compound aqueous solution selected from the group consisting of sodium fluoride, potassium fluoride and ammonium fluoride and then washed with ultra-pure water.

21. (currently amended) The process for producing a purified aqueous hydrogen peroxide solution as claimed in claim 5, wherein the fluoride ion (F^-) ~~type~~ anion exchange resin is regenerated by repeating a process, two or more times, in which the anion exchange resin is treated with at least one fluorine compound aqueous solution selected from the group consisting of sodium fluoride, potassium fluoride and ammonium fluoride and then washed with ultra-pure water.

22. (previously presented) The process for producing a purified aqueous hydrogen peroxide solution as claimed in claim 4, wherein the adsorption resin is regenerated by treating with an alcohol aqueous solution as a regenerant and then washing with ultra-pure water.

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23. (previously presented) The process for producing a purified aqueous hydrogen peroxide solution as claimed in claim 5, wherein the adsorption resin is regenerated by treating with an alcohol aqueous solution as a regenerant and then washing with ultra-pure water.

24. (previously presented) The process for producing a purified aqueous hydrogen peroxide solution as claimed in claim 6, wherein the adsorption resin is regenerated by treating with an alcohol aqueous solution as a regenerant and then washing with ultra-pure water.

25. (currently amended) The process for producing a purified aqueous hydrogen peroxide solution as claimed in claim 10, wherein the fine filter has an average pore size of ~~0.2~~ 0.1 μm or less.

26. (currently amended) The process for producing a purified aqueous hydrogen peroxide solution as claimed in claim 11, wherein the fine filter has an average pore size of ~~0.2~~ 0.1 μm or less.

REMARKS/ARGUMENTS

Claims 1-26 are pending in the application.

Amendments have been made to the specification to correct minor translational errors, to overcome the rejections under 35 U.S.C. § 112, and to more particularly describe the invention. Claims 1-6 and 13-21 have been amended to more particularly claim the invention. Claims 9 and 12 have been amended to indicate the pore size in the filter. Claims 3 and 13 have been amended to correct minor translational errors. No new matter has been added. Support for the Amendments can be found on page 13, lines 7-8 and on page 36, lines 5-7 of the specification. Entry of these amendments is respectfully requested.

35 U.S.C § 112 Rejections

The Examiner rejected claims 1-26 under 35 U.S.C.§ 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the invention. The claims have been amended to correct grammatical errors, the word "type" was removed, and the pore size of the filter was defined. Since the corrections have been made, Applicants respectfully request that the rejection be withdrawn.

35 U.S.C.§ 103 Rejections

The Examiner rejected claims 1, 4, 5, 8-12, 18 and 20-26 under 35 U.S.C. § 103(a) as being unpatentable over United States Patent No. 5,961,947 to Ledon et al. (hereinafter "Ledon et al. '947") in view of United States Patent Nos. 4,999,179 to Sugihara et al. (hereinafter "Sugihara et al. '179"), 5,534,238 to Kajiwara at al. (hereinafter "Kajiwara et al. '238") or 5,976,487 to Kajiwara et al. (hereinafter "Kajiwara et al. '487").

Ledon et al. '947 discloses a process for producing a purified aqueous hydrogen peroxide solution comprising at least one sequence which includes successively passing a hydrogen peroxide solution to be purified through at least two beds of cation exchange adsorbents (CEA) and at least two beds of anion-exchange adsorbents (AEA) according to the sequence:

$$AEA \rightarrow CEA \rightarrow AEA \rightarrow CEA$$

The Comparative Examples in the present invention and the Example in Ledon et al. '947 both use an anion exchange resin in the bicarbonate form. **However, Ledon et al. '947 never discloses the specific sequence of (i) or (ii) of exchange resins, which is described below.** In the purification of the aqueous hydrogen peroxide solution in

the present invention, the aqueous hydrogen peroxide solution is contacted with specific resins in the following sequence:

(i) H^+ cation exchange resin, followed by carbonate ion or bicarbonate ion anion exchange resin, followed by H^+ cation exchange resin (claim 1)

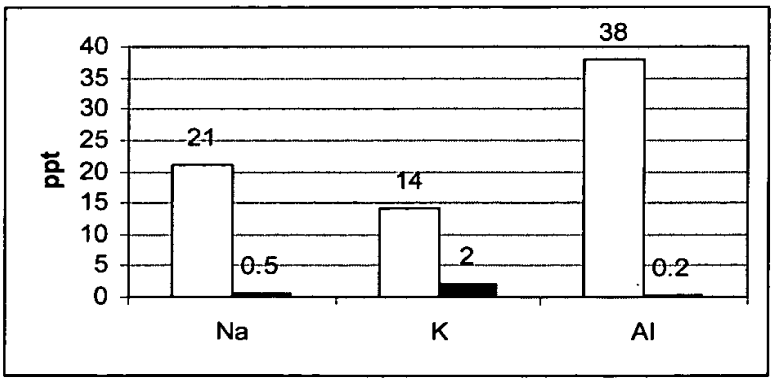
(ii) H^+ cation exchange resin, followed by carbonate ion or bicarbonate ion anion exchange resin, followed by F^- type anion exchange resin, followed by H^+ cation exchange resin (claim 2)

If claim 1 of the present invention was rewritten to describe the sequence in the same manner as Ledon et al. '947, the sequence would be CEA → AEA → CEA. Claim 2 would read as CEA → AEA(F-) → AEA(CO_3^{2-} or HCO^{3-}) → CEA. As can be seen from each sequence, **both are different from the sequence that is disclosed in Ledon et al. '947.**

There are commonly known purifying methods which consist of contacting an aqueous hydrogen peroxide solution with a cation exchange resin and then with an anion exchange resin and then with an anion exchange resin and a purifying method using a mixed bed of a cation exchange resin and an anion exchange resin as in Ledon et al. '947. However, Applicants discovered that metal ion impurities such as Na, K, and Al, originating from the final anion exchange resin, elute into an aqueous hydrogen peroxide solution, and thereby exist as metal ion impurities. Furthermore, Applicants found that when metal ion impurities such as Na, K, and Al, which originated from the anion exchange resin, are removed again by the cation exchange resin, the metal ion impurities can be removed up to a considerably high purity level, and also the ability of duplicating the high purity level is high.

The effects described above are shown in the Examples of the present specification. For example, the difference in the effect will be understood by comparing Example 1 with Co-Example 1. In Co-Example 1, the second H^+ cation exchange resin treatment was not carried out. The results are displayed in the chart below for comparison.

Co-Example 1 (white)



Example 1 (black)

Furthermore, in the process for producing a purified aqueous hydrogen peroxide solution of the present invention, the aqueous hydrogen peroxide solution may be contacted with a fluoride ion anion exchange resin after being brought into contact with the H^+ cation exchange resin, before being brought into contact with the above-mentioned carbonate ion (CO_3^{2-}) or bicarbonate ion (HCO_3^-) anion exchange resin. By contacting the anion exchange resin converted into a fluoride ion type with aqueous hydrogen peroxide solution, silica dissolved in the aqueous hydrogen peroxide solution is captured by the anion exchange resin and removed.

Sugihara et al. '179 merely discloses the use of an ion exchange resin in which the Na^+ ion form is converted to H^+ ion form.

Kajiwara et al. '238 and Kajiwara et al. '487 disclose that when an anion exchange resin is used as ion exchange resin, a strong basic anion exchange resin of a bicarbonate form, a carbonate form, or a hydroxide form is used.

Additionally, none of Ledon et al. '947, Sugihara et al. '179, Kajiwara et al. '238, and/or Kajiwara et al. '487 disclose the filter pore size recited in claims 9 and 12, along with the results and steps of the present invention. See page 36 of the specification.

The results and steps of the present invention are not disclosed in Ledan et al. '947 or in Ledan et al. '947 in view of the cited secondary references. Additionally, "[t]he level of skill in the art cannot be relied upon to provide the suggestion to combine references." *Al-Site Corp. vs. VSI Int'l Inc.*, 174 F.3d 1308, 50 USPQ2d 1161 (Fed. Cir. 1999). Therefore, the present invention is not obvious over Ledan et al. '947 in view of Sugihara et al. '179 or Kajiwara et al. '238 or Kajiwara et al. '487, considered individually or in combination. In view of the above arguments, Applicants respectfully request that the rejection be withdrawn.

Claims 3, 7, 15, 17, and 19 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Sugihara et al. '179 or Kajiwara et al. '487 or Kajiwara et al. '238, and further in view of either United States Patent Nos. 6,054,109 to Saito et al. (hereinafter "Saito et al.") and 5,851,505 to Nishide et al. (hereinafter "Nishide et al.").

Sugihara et al. '179 merely discloses the use of an ion exchange resin in which the Na^+ ion form in converted to H^+ ion form.

Kajiwara et al. '238 and Kajiwara et al. '487 disclose that when an anion exchange resin is used as ion exchange resin, a strong basic anion exchange resin of a bicarbonate form, a carbonate form, or a hydroxide form is used.

Saito et al. and Nishide et al. disclose that an organic impurity in a highly purified aqueous solution of hydrogen peroxide is removed by contacting the solution with a hydrophilic porous resin having the specific surface area.

However, these references neither disclose nor suggest the specific sequence of (i) or (ii) of the ion exchange resins in the present invention. These references never disclose or in any way suggest the combination ion exchange resin steps or sequence of steps of the ion exchange resins. Therefore, claims 3, 7, 15, 17, and 19 are not obvious over Sugihara et al. '179 or Kajiwara et al. '487 or Kajiwara et al. '238, and further in view of either Saito et al. and Nishide et al., taken individually or in combination. Therefore, Applicants respectfully request that the rejection of claims 3, 7, 15, 17, and 19 be withdrawn.

Claims 2, 6, 14, and 16 are rejected under 35 U.S.C. § 103(a) as being unpatentable over United States Patent No. 5,733,521 to Minamikawa et al. (hereinafter "Minamikawa et al. '521"). Claim 13 is rejected under 35 U.S.C. § 103(a) as being unpatentable over Minamikawa et al. '521 and further in view of either Saito et al. or Nishide et al.

Minamikawa et al. '521 discloses that a purified aqueous hydrogen peroxide solution having a high purity from which silicones, metals and anions having been removed can be produced by using an anion exchange resin in the fluoride form in combination with conventional ion exchange resins. However, Minamikawa et al. '521 never discloses the above-described specific sequence of (i) or (ii) of the present exchange resins.

Saito et al. and Nishide et al. disclose that an organic impurity in highly purified aqueous solution of hydrogen peroxide is removed by contacting the solution with a hydrophilic porous resin having the specific surface area.

As such, no combination of Minamikawa et al. '521 or Saito et al. or Nishide et al. discloses or in any way suggests the present invention. Therefore, it is clear that the present invention is not obvious over Minamikawa et al. '521, or over Minamikawa et al. '521 in view of Saito et al. and Nishide et al., taken individually or in combination. Applicants respectfully request that the rejections of claims 2, 6, 13, 14, and 16 be withdrawn.

In view of the foregoing remarks, it is believed that the present application is in condition for allowance. Reconsideration of the rejections and allowance of claims 1- 26 are respectfully requested.

Respectfully submitted,

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